IV. How Clean Is Surface Water in Arizona?

A statewide overview of assessments is provided in this chapter. A map illustrating surface waters assessed **(Figure 17)** indicates that surface water in Arizona is generally attaining its designated uses. Assessment information about individual surface waters is provided in Volume II. The discussion and graphics in this section relate only to the assessed surface waters located on nontribal lands in Arizona.

Water quality in rivers, canals, and washes.

For this assessment, 2547 miles of streams, canals, and washes were assessed **(Figure 15 and Table 7.)**. Although this is less than 3% of the 90,375 miles of Arizona's streams, it includes 57% of the state's perennial stream and canal miles (1998 miles of the estimated 3530 perennial miles). Monitoring and assessing surface waters that lack flowing water present a set of challenges, so Arizona's goal is to assess all of its perennially flowing streams and the majority of the streams with extended intermittent flow.

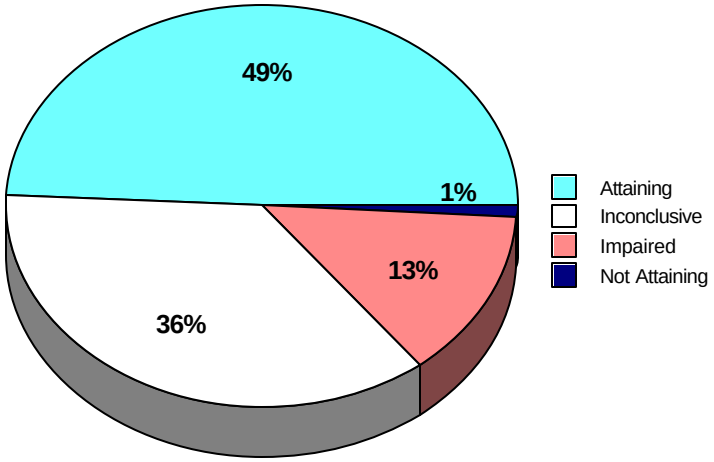

Figure 15. Use Support Assessments – Streams

As illustrated in **Figure 16**, the relative number of stream miles attaining a given designated use is approximately consistent across all designated uses, with 30-50% attaining the use, 30-50% inconclusive and needing more monitoring, and only 0-15% impaired or not attaining the use. (In **Figure 16 & 19**, "Body Contact" combines Full Body Contact and Partial Body Contact designated uses.)

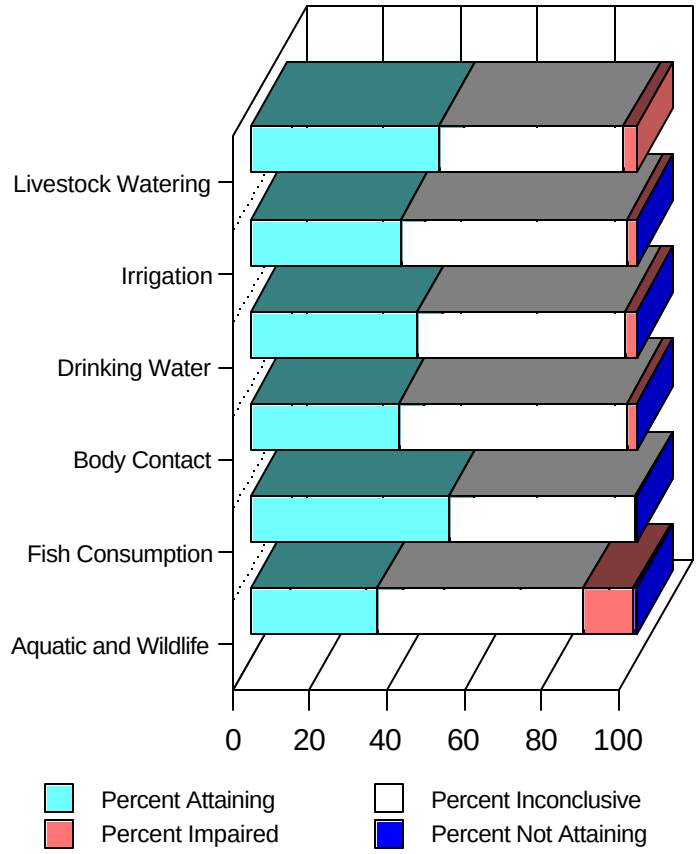

Figure 16. Designated Use Support by Category – Streams

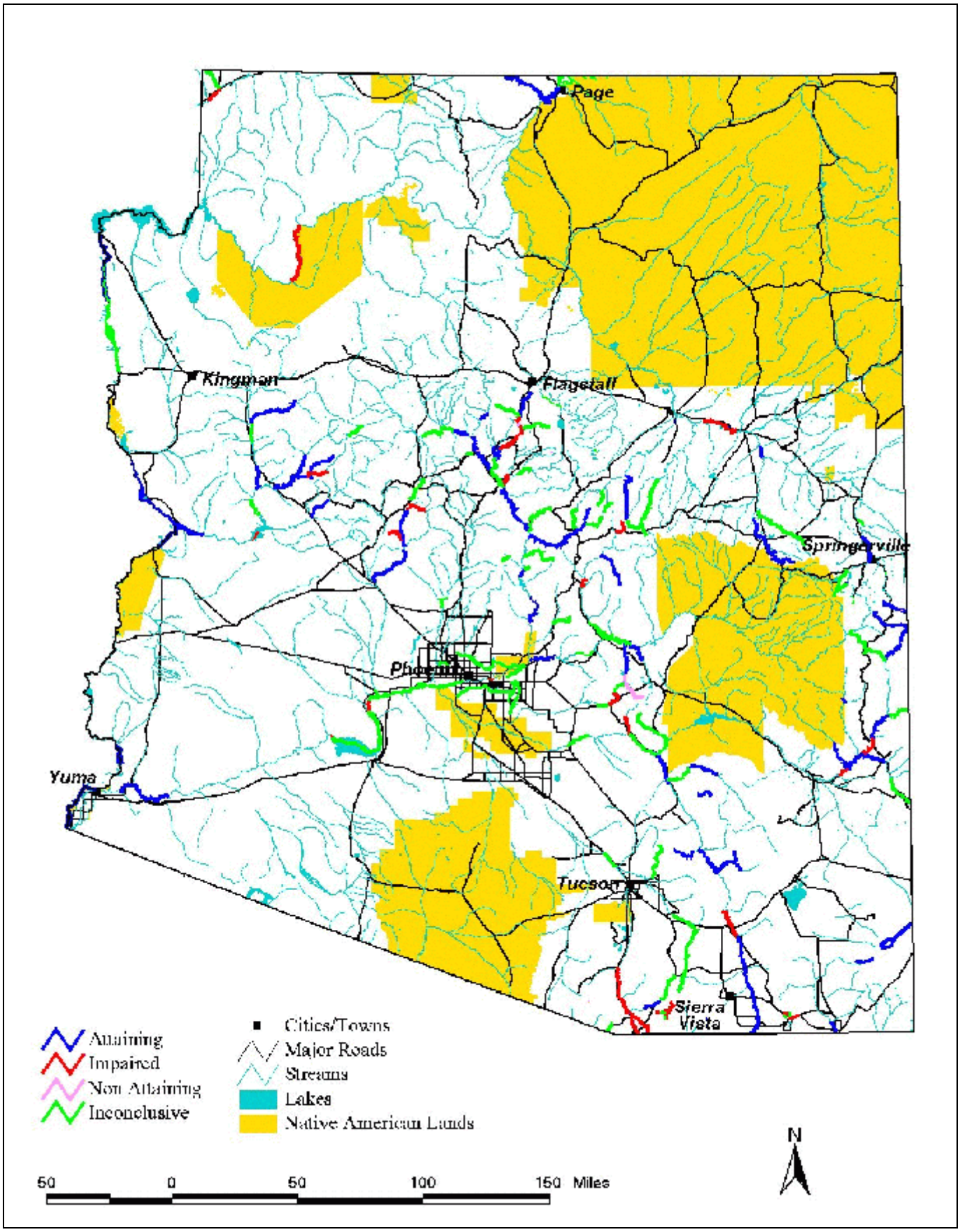

Figure 17. Surface Water Assessments in Arizona – 2002

Table 7. Use Support Summary – Streams Assessed in 2002

Designated Uses	Attaining (miles)	Inconclusive (miles)	Impaired (miles)	Not Attaining (miles)	Total Assessed (miles)
Overall Use Support	**1253.7**	**929.2**	**342.1**	**22**	**2547**
Aquatic and Wildlife (combined)	**775.1**	**1255.8**	**308.3**	**21**	**2360.3**
Coldwater Aquatic Community	374.2	564	90.4	0	1028.6
Warmwater Aquatic Community	395.6	633.3	185.1	20	1234
Ephemeral	0	16.4	10.9	1	28.4
Effluent Dependent Water	5.3	42.1	21.8	0	69.2
Recreation (combined)	**1204.4**	**1097.5**	**105.2**	**1**	**2408.1**
Fish Consumption	1190.8	1130.7	10	0	2331.5
Full Body Contact	839.4	1301.3	58.3	1	2200
Partial Body Contact	5.3	101.7	36.9	0	143.9
Domestic Water Source	**220.8**	**274.8**	**17**	**0**	**512.6**
Agriculture (combined)	**1171.2**	**1114.6**	**87.8**	**0**	**2373.6**
Agricultural Irrigation	632.8	953.6	42.2	0	1628.6
Agricultural Livestock Watering	1149.4	1126.5	82.5	0	2358.4

Water quality in lakes and reservoirs.

Of approximately 168,600 acres of perennial lakes or reservoirs in Arizona (not on Indian lands), 84,643 acres (50%) were assessed. There are approximately 564 impoundments in Arizona, many of which have not yet been characterized. ADEQ's goal is to assess all perennial, publicly-owned lakes over the next two watershed cycles.

Of the lake acres assessed, 23% were attaining and less than 15% were impaired or not attaining **(Figure 18 and Table 8)**. Lakes vary greatly in size: urban city park lakes may be smaller than an acre, while the big reservoirs are larger than 10,000 acres. So, although these graphics depict the surface area of water impaired, they do not represent the number of lakes.

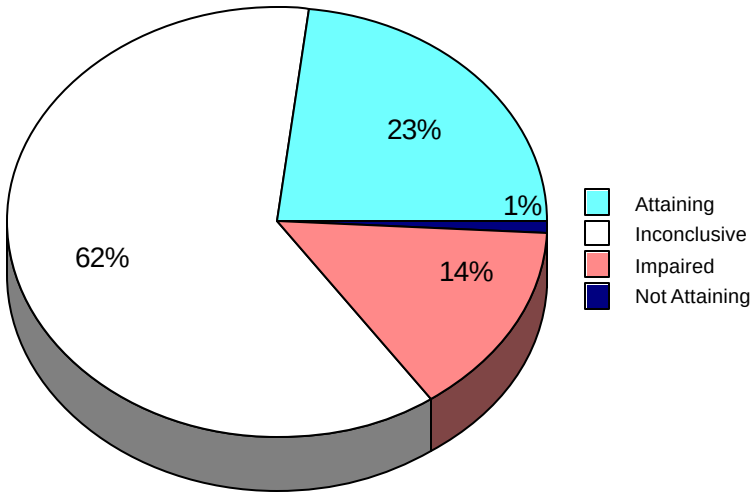

Figure 18. Use Support Assessments – Lakes

As illustrated in **Figure 19**, the percent of lakes attaining a given designated use is also consistent among all designated uses, with 20-30% attaining the use, 60-70% inconclusive and needing more monitoring, and only 0-20% impaired or not attaining the use.

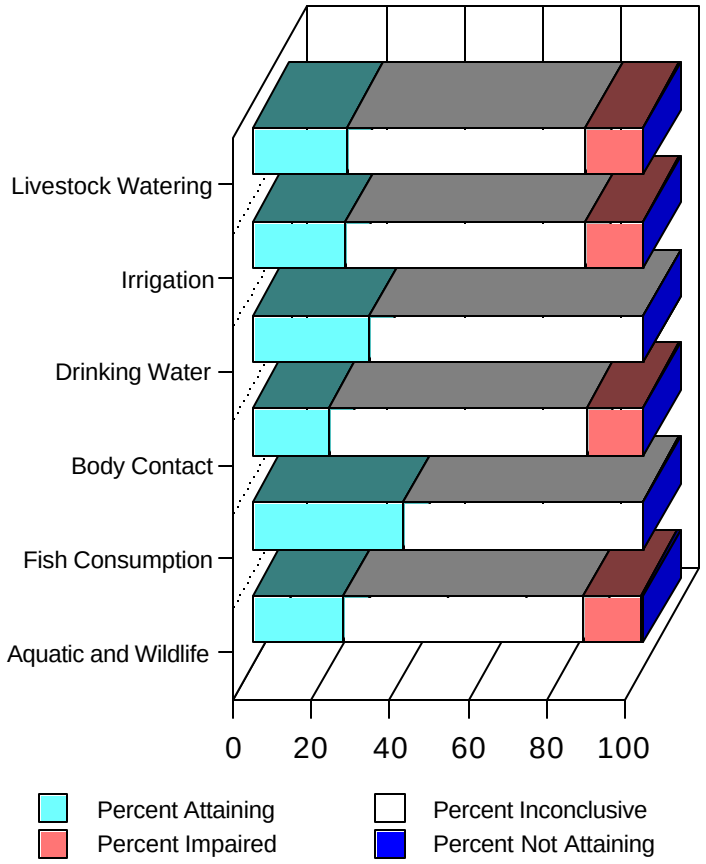

Figure 19. Designated Use Support by Category – Lakes

Table 8. Use Support Summary – Lakes Assessed in 2002

Designated Uses	Attaining (acres)	Inconclusive (acres)	Impaired (acres)	Not Attaining (acres)	Total Assessed (acres)
Overall Use Support	**20275**	**51392**	**12136**	**840**	**84643**
Aquatic and Wildlife (combined)	**19697**	**52040**	**12247**	**560**	**84544**
Coldwater Aquatic Community	1158	29295	125	231	30809
Warmwater Aquatic Community	18539	22930	11950	95	53514
Ephemeral	0	0	0	220*	220*
Effluent Dependent Water	0	0	0	0	0
Recreation (combined)	**20291**	**51472**	**12136**	**634**	**84533**
Fish Consumption	32486	51658	0	169	84313
Full Body Contact	16341	55605	11950	245	84141
Partial Body Contact	0	72	0	220*	292
Domestic Water Source	**19561**	**45372**	**0**	**0**	**64933**
Agriculture (combined)	**20308**	**51411**	**12136**	**245**	**84100**
Agricultural Irrigation	20080	51480	12136	125	83821
Agricultural Livestock Watering	20216	51479	12136	245	84076

* Note that Tempe Town Lake was assessed using Salt River designated uses according to the Tributary Rule (R18-11-105); therefore, the lake was assessed as Aquatic and Wildlife ephemeral with Partial Body Contact. Specific designated uses for this surface water have been developed, but need to be approved by EPA through the Triennial Review Process before they can be applied. If already adopted, the overall assessment would remain the same ("not attaining," but new lake management program is being implemented to control algal growth and pH); however, the specific designated uses would be changed.

What pollutants impair Arizona's lakes and streams?

The pollutant is a substance causing a designated use to be assessed as "impaired" or "not attaining" when the amount exceeds an established water quality standard. Pollutants identified in this assessment are summarized in **Table 9 and 10** and compared in **Figures 20 and 21**. More than one pollutant may be simultaneously impacting a stream reach or lake.

Table 9. Pollutants Impairing Arizona's Streams – 2002

	Impaired or Not Attaining (miles)
Metals/Metalloids	
arsenic	3
beryllium	10
boron	5.3
cadmium	36.7
copper	122.8
manganese	9.8
silver	17.4
zinc	96
any metal*	**149.4**
Turbidity	125.4
Pathogens	60.6
Other Chemicals	
Fluoride	28.5
pH	
low pH	18.3
high pH	0
Nutrients	
Nitrate	15.5
Chlorine	7.2

*Note that multiple pollutants may be impairing a stream segment.

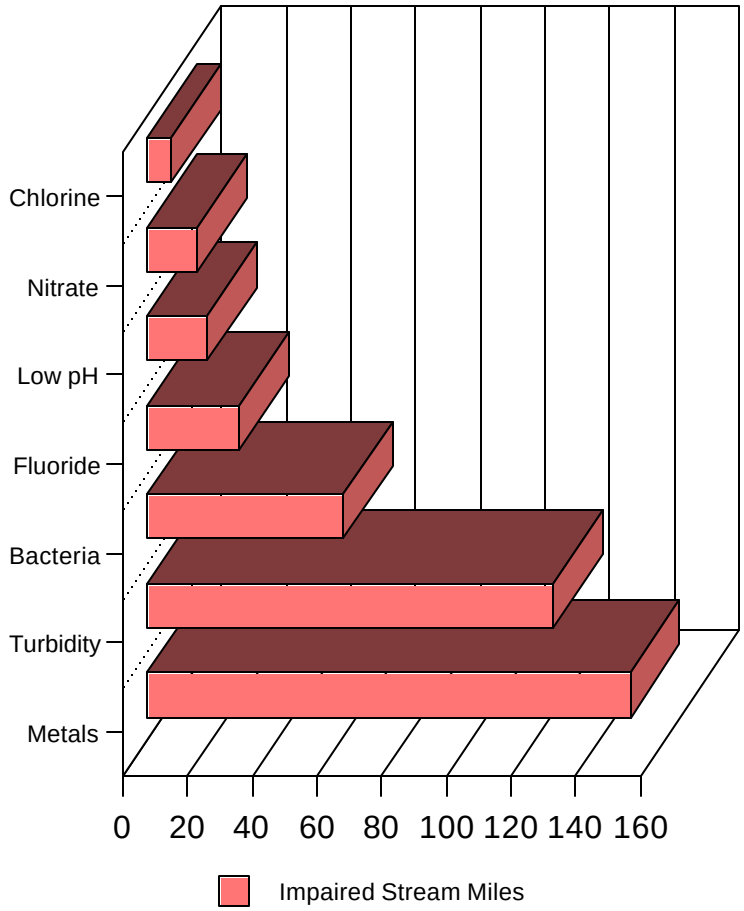

Figure 20. Pollutants impairing streams – 2002 Assessment

Table 10. Pollutants Impairing Arizona's Lakes – 2002

	Impaired or Not Attaining (acres)
pH	
Low pH	0
High pH	1974
Low Dissolved Oxygen	1820
Other Chemicals	
Sulfide	1414
Nutrients	231
Pathogens	186
Metals	
Mercury	169

Information about the pollutants impairing a specific lake or stream is provided in Volume II. However, some general information about these pollutants and their sources follows.

Metals – Metals can leach more readily from soil or mineralized rock where exposed by mining, road building or land development activities. Ore bodies can also naturally contribute metals to streams and ground water springs recharging streams. Arizona has extensive areas of mineralized rock, and therefore, a high potential for metals pollution.

To date, mercury has only been found to be a problem in Arizona's lakes, while the other metals are generally exceeding standards in streams. This is due to the characteristics of these metals. Generally metals (e.g., beryllium, cadmium, copper, manganese, mercury, silver, and zinc) rapidly adhere to sediment, with the more toxic dissolved metals being present in surface water only for relatively short distances near mining sites or other potential sources. These discharges are located near streams in Arizona, and therefore, effect stream water quality. When metal-contaminated sediment is transported downstream to a lake, the water slows and the sediments drop to the bottom of the lake. Metals do not readily go back into a dissolved state in these relatively alkaline lakes, and the

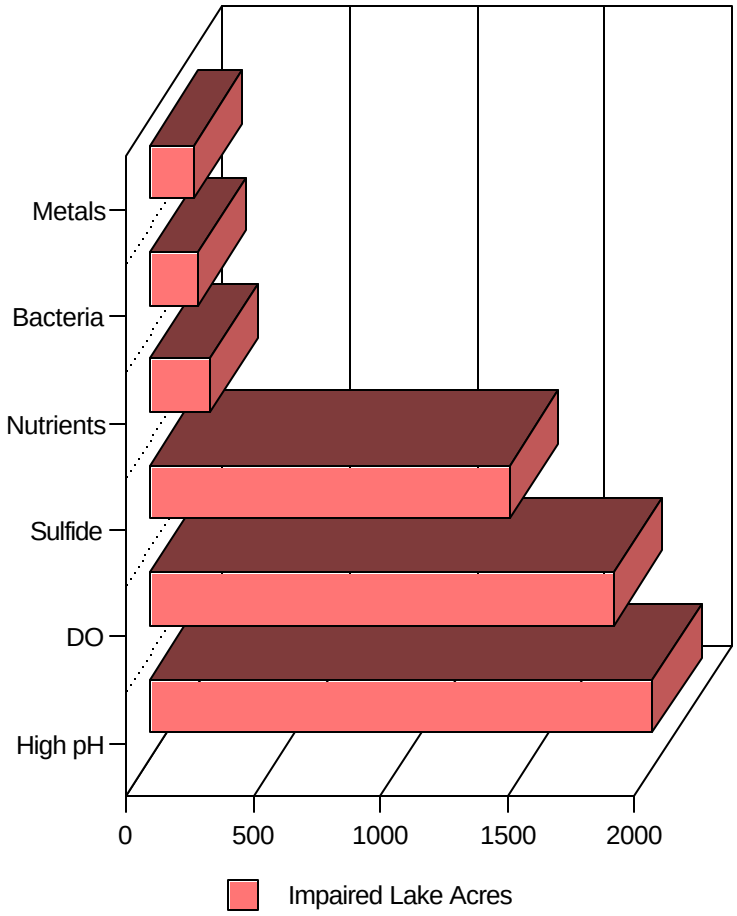

Figure 21. Pollutants Impairing Lakes – 2002 Assessment

contamination is buried under layers of sedimentation.

Mercury is an exception. Once elemental mercury is methylated by microbes in the bottom of the lake, methylmercury can then bioaccumulate in aquatic life. The concentration of mercury then biomagnifies (compounds) as contaminated tissue is consumed in the food chain. This also means that mercury can occur well below the detection limit in surface water samples and even in the

sediment, while fish tissue can be contaminated through bioaccumulation to a level that is hazardous for human consumption or for wildlife that prey on these fish.

Turbidity – Turbidity is actually a measurement of the clarity of water. Turbidity standards were developed to protect Aquatic and Wildlife designated uses because high turbidity may be associated with aquatic habitat degradation such as excessive bottom deposits or algal blooms. Arizona's turbidity standard was derived from criteria established in more humid states that do not share its unique arid conditions and resulting relatively low plant coverage and erodible soils. A revision to the surface water standards has been submitted to EPA for approval as part of the recently completed 2002 Triennial Review. If approved by EPA, the turbidity standard would be replaced with a "suspended sediment concentration" standard that is applied only at base flow. For more information concerning this standard, contact the Surface Water Standards Program -- Steve Pawlowski at (602) 771-4219. For this assessment, water quality samples were evaluated based on the existing turbidity standard. If sufficient exceedances exist, waters were listed as impaired due to turbidity.

Low Dissolved Oxygen, High pH and Nutrients – Varying combinations of these factors occur in many of Arizona's shallow, constructed lakes. Low dissolved oxygen and high pH stress aquatic organisms and can contribute to fish kills. A high density of submerged and emergent aquatic vegetation can restrict recreational activities. In addition, algal blooms which can result from increased nutrients use a substantial amount of oxygen in the water at night when photosynthesis cannot take place. Significant decreases of dissolved oxygen can result in fish kills.

What are the major sources of these pollutants?

The probable sources of pollutants impairing water quality in Arizona are reported in **Tables 11 and 12** and compared in **Figures 22 and 23.** More than one source may be impacting a given stream reach or lake. Documented source identification has been limited to data collected for special investigations or for the development of Total Maximum Daily Load analysis. For many assessments, only potential sources are indicated based on best available information, knowledge of land uses and activities, and geology of the watershed.

Natural Contributions -- While pollution is defined in the Clean Water Act section 502 as a manmade or human-induced alteration of the chemical, physical, biological, and radiological integrity of water, high levels of a pollutant which occur solely due to natural conditions are not a violation of Arizona's surface water quality standards because of a "natural background" exemption in the standards. However, determining the relative contribution of natural sources among other potential sources may require sophisticated analysis requiring large amounts of data. This level of detailed analysis is conducted for a TMDL, use attainability analysis, or to develop a site-specific standard.

For most assessments, natural conditions are assumed to contribute some pollutants. In many areas, Arizona's soils are highly erodible, and therefore have potential to contribute suspended sediment easily. Soils also have naturally elevated levels of metals. Sunny and arid conditions can lead to excessive algal productivity and eutrophic lake conditions such as low dissolved oxygen and high pH.

Resource Extraction – Resource extraction activities and the natural occurrence of ores are frequently the source of metals and low pH in Arizona's streams. Mining occurs in Arizona because metal ores are present.

Nutrient Cycling – Although normal for a lake system, nutrient cycling may also be a contributing source of nutrient over-enrichment and hypereutrophic conditions.

Shallow Lake Design and Maintenance – The construction and maintenance of a relatively shallow lake can result in negative impacts to the water chemistry or biological community. The physical characteristics of the lake (depth, volume, flushing rate) need to be in balance with natural rates of sediment transport and trophic conditions. When a lake or reservoir routinely exceeds narrative or numeric standards, viable options to redesign or change maintenance procedures of the surface water may be necessary to alleviate the water quality problems.

Agriculture -- Agricultural concerns can be broadly grouped into three areas of concern: crop production, agriculture, and grazing.

- Irrigated crop production is a probable source of pollutants such as turbidity, boron, selenium, nutrients, and pesticides. Crop production is concentrated around areas with adequate surface or ground water in

Arizona, such as along the Colorado River, the Salt River, the Gila River, and the Verde River.

- Livestock and wildlife grazing is ever present, occurring on lands owned or managed by federal agencies, Arizona State Land Department, privately owned lands and Indian reservations. Grazing activities may contribute pollutants such as bacteria, nutrients, and suspended sediments (measured as turbidity).
- Concentrated animal feeding operations (CAFOs) are scattered across the state. These livestock holding areas are a concern due to potential discharges of nutrients, bacteria, and turbidity to surface and ground waters.

Table 11. Probable Sources of Streams Pollutants – 2002

	Impaired or Not Attaining (miles)
Natural Sources	290.1
Resource Extraction (including abandoned mines)	155.7
Unknown Source	146.3
Source Outside Arizona Jurisdiction (Mexico, Indian lands, or other state)	71.7
Agriculture	**56.7**
Crop Production	5.3
Grazing Practices	51.4
Recreation (non-boating)	54.5
Municipal Point Sources	27.7
Ground Water Loadings	15.5
Waste Disposal	15.5

Multiple sources may be impacting a stream reach.

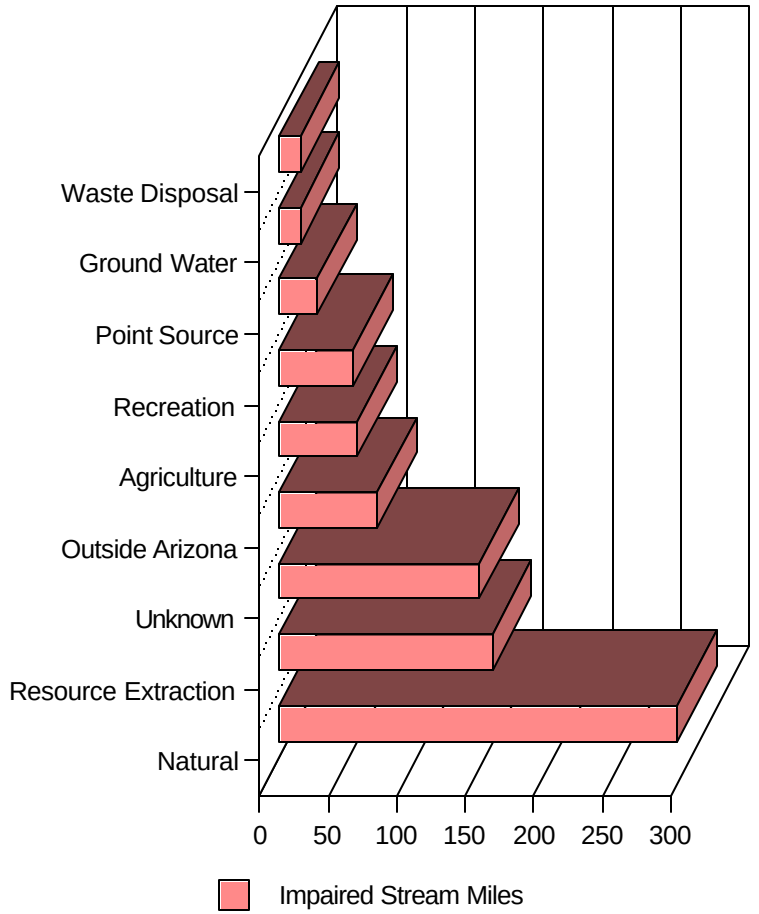

Figure 22. Probable Sources of Pollutants in Streams – 2002

Table 12. Probable Sources of Lake Pollutants – 2002

	Impaired or Not Attaining (acres)
Natural Sources	2278
Unknown Source	1863
Internal Nutrient Cycling	671
Design and Maintenance	621
Agriculture Crop production Grazing practices	**316** 186 130
Stormwater Runoff	186
Atmospheric Deposition	169
Septic systems	125
Silviculture (forestry practices/forest roads)	120
Resource Extraction (including abandoned mines)	51

Multiple sources may be impacting a lake acre.

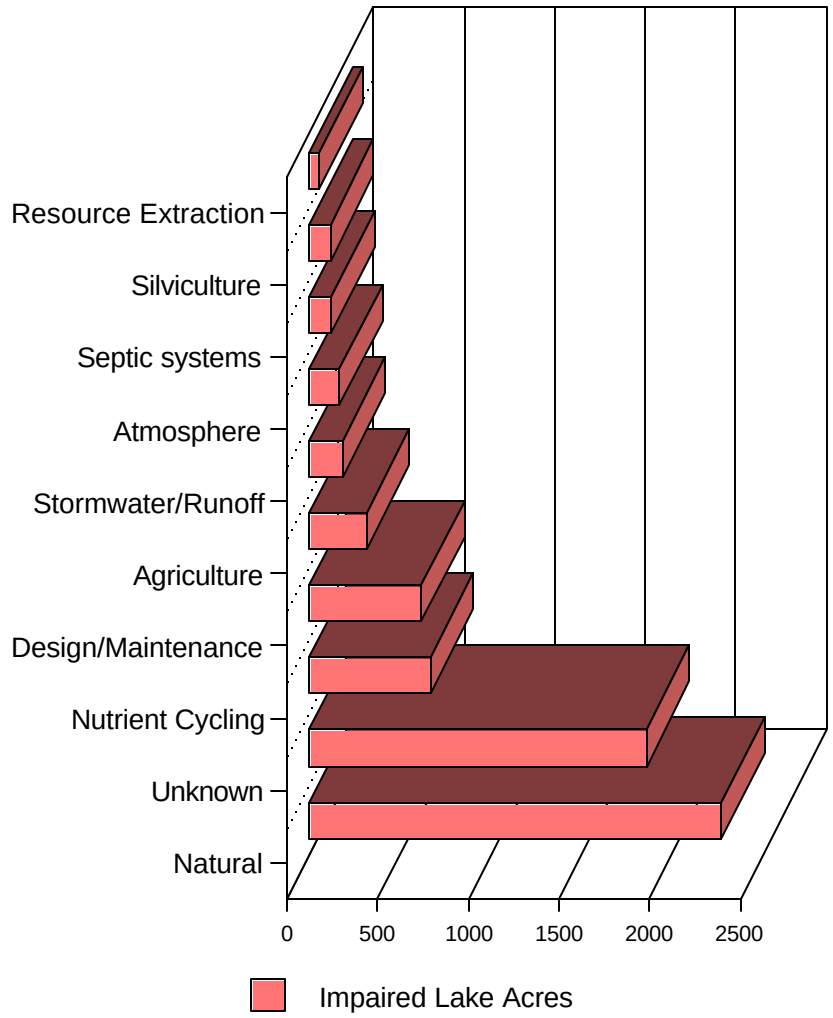

Figure 23. Probable Sources of Pollutants in Lakes – 2002

A few words about point and nonpoint sources.

Water pollution is often discussed in terms of "point" and "nonpoint" sources. Thirty years ago, federal and state regulations primarily governed point source discharges through NPDES permit requirements. Point sources come from a discrete discharge point or discharge pipe (e.g., wastewater treatment plant discharge). However, water pollution also comes from more diffuse sources that are referred to as nonpoint sources, such as runoff from fields, urban areas, or mining operations.

As indicated in **Table 13**, most pollution in Arizona's surface waters is contributed by nonpoint or diffuse sources of pollution. This may indicate the effectiveness of the state and federal regulatory programs working with point source discharges and that control of nonpoint source contributions largely remains non-regulatory, based on education and funding mitigation projects.

Table 13. Point and Nonpoint Source Contribution to Impairment

	Streams, Canals, Washes	Lakes and Reservoirs
Point Sources	27.7 miles	0 acres
Nonpoint Sources	358.8 miles	620 acres

*Note that the stream miles impaired by point sources are also impaired by nonpoint sources.

For example, in addressing nonpoint source contributions to an impaired surface water, the TMDL Program works with all interested parties to identify credible implementation strategies to mitigate the problem. Then ADEQ's Nonpoint Source and Watershed Management Programs work with the local watershed work groups and federal agencies to identify funding sources to implement control strategies. Federal agencies such as the Forest Service and Bureau of Land Management, address nonpoint source pollution in their management strategies by requiring the implementation of Best Management Practices.

Current nonpoint source projects are described in Volume II, within the watershed reports.

Is the water safe to drink, swim in, and fish from?

Can We Drink the Water? – The quality of water delivered by public water systems is strictly regulated and monitored to ensure that federal and state standards established to protect public health are met. Drinking water advisories are issued by the supplier when monitoring confirms that a drinking water standard has been exceeded. If water is supplied by a public water system, information about the quality can be obtained by contacting the supplier and requesting a consumer confidence report, or by contacting ADEQ's Drinking Water Program at 1-800-771-5677 extension 4624.

When water is supplied by a private water system (i.e., a system serving less than 15 connections and 25 people), it is the user's responsibility to test and protect the quality of their drinking water. General water quality information and ways to protect drinking water sources can be obtained by contacting a county health department. Ground water quality information about wells monitored in an area can also be obtained from EPA's STORET database through the internet at: http://www.epa.gov/STORET

Is It Safe to Swim in the Water? – During the swimming season in 1999 through 2001, frequently visited swimming areas were monitored at Slide Rock, Lake Havasu, Lake Powell, and the Salt River Recreation Area. Beaches have been closed when sample results exceed water quality standards and remain closed until standards are met. Investigations of potential sources have been completed in these swimming areas, and have resulted in actions to control contamination and risk to public health (see studies and mitigation projects in Volume II). Monitoring at each of these popular swimming areas is summarized in the following discussion.

- Slide Rock State Park monitors water quality daily during the summer at Slide Rock in Oak Creek. A bacteria Total Maximum Daily Load (TMDL) analysis has been completed on Oak Creek at Slide Rock State Park to estimate contributing loads from sources within this sub-watershed and to develop alternatives to mitigate these impacts to water quality. (See TMDL discussion in the Verde Watershed section of Volume II.)
- Mohave County monitors beaches twice a week in Lake Havasu during the summer. No beach closures occurred in 2000 or 2001 after extensive studies and mitigation actions in Thompson Bay in the 1990's.

- The Bureau of Reclamation monitors beaches once a week during the summer in Lake Powell. Lake Powell beach closures have occurred only in Utah.
- The US Forest Service monitors the Salt River Recreation Area under contract by ADEQ. Monitoring data show nominal bacterial levels, well below standards established for swimming or full body contact. ADEQ awarded a Water Quality Improvement Grant to conduct weekly monitoring and improve sanitary conditions in this heavily used recreation area.

Information about swimming area closures during the past two years is reported in **Table 14.** ADEQ is unaware of routine monitoring at other swimming and water-skiing areas. Past bacteria monitoring suggests swimming should be avoided in storm water runoff and if the water has become stagnant. Waters classified as "effluent dependent waters" and many urban lakes are also not designated for swimming or wading uses.

Table 14. Swimming Area Closures 1999-2001

Waterbody Name Size	Pollutant and Sources	Closure Dates
Beaches in Thompson Bay of Lake Havasu 150 acres	Bacteria in water and sediment in the past.	Sept. 1999
Slide Rock 1 mile segment of Oak Creek	Bacteria in water and sediment. High flows or large numbers of people stir up sediments, raising bacteria counts to levels that merit swimming area closures.	July 15, 1999 July 26, 1999 Aug 16, 1999

Should We Eat the Fish? – Some chemical pollutants concentrate in fish and shellfish by accumulating in fatty tissues or selectively binding to muscle tissue. Some of these pollutants cannot be detected in the water column nor in bottom sediments, but bioaccumulate in aquatic life. This bioaccumulation may pose a threat to human health if these organisms are eaten on a regular basis in excess of federal fish consumption advisory guidelines.

Fish consumption advisories are issued to inform the public about possible adverse health effects and contain recommendations for how many fish meals can safely be consumed. Advisories may be directed at a particular subset of the population because some people are at greater risk (e.g., sport or subsistence fishers, pregnant women and children) rather than a total ban.

In Arizona, fish consumption advisories are currently in effect at four sites **(Table 15)**. Additional information about fish tissue screening and fish advisories can be obtained by contacting ADEQ at (602) 771-4536 or Arizona Game and Fish Department at (602) 789-3260.

Table 15. Fish Consumption Advisories – 2002

Waterbody Name Size	Pollutant and Sources	Advisory and Date
Painted Rocks Reservoir, Painted Rock Borrow Pit Lake, and portions of the Gila, Salt, and Hassayampa rivers – 380 acres and 140 miles	DDT metabolites, toxaphene, dieldrin, and chlordane pesticide pollutants due to historic use of these banned pesticides.	Since 1991 – Do not consume fish and other aquatic organisms.
Dysart Drain (canal drains to Agua Fria River in the Phoenix metro area) – 3 miles	DDT metabolites contamination caused by historic use of this pesticide.	Since 1995 – Do not consume fish and other aquatic organisms.
Arivaca Lake – 120 acres	Mercury contamination. Potential sources include mine tailings, atmospheric deposition, and naturally mineralized soils.*	Since 1996 – Do not consume fish and other aquatic organisms.
Pena Blanca Lake – 50 acres	Mercury contamination caused by historic mining and natural conditions at the lake.*	Since 1995 – Do not consume fish and other aquatic organisms.
Upper and Lower Lake Mary – 1625 acres combined	Mercury contamination. Sources to be investigated.	Issued May 2002 – Do not consume walleye fish and limit consumption of other fish to one 8-ounce fillet per month.

* Source identification and remediation actions have been developed through the Total Maximum Daily Load (TMDL) analysis process (see Chapter VII).

ADEQ is investigating opportunities to combine resources from multiple programs to determine the source, transport, and fate of historically used pesticides along the Gila River and its tributaries between Phoenix and Painted Rocks Lake. This study could be used to update the health risk assessment issued in 1991 by the Arizona Department of Health Services and to complete a TMDL analysis for these pesticides. (See Middle Gila Watershed -- Volume II.)

National Mercury Fish Consumption Advisory – In January 2001, EPA issued a national advisory concerning risks associated with mercury in freshwater fish caught by friends and family for women who are pregnant or may become pregnant, nursing mothers, and young children. EPA is recommending that these most vulnerable groups limit fish consumption to one meal per week. That would be six ounces of cooked fish (eight ounces of uncooked fish) for an adult, and two ounces of cooked fish (three ounces uncooked) for a young child. US Food and Drug Administration has a companion advisory concerning the hazard posed by some fish purchased commercially (http://www.cfsan.fda.gov).

Nationally, mercury is introduced into water at higher than natural background levels due to air deposition. However, the main sources of mercury in Arizona are natural deposits and anthropogenic use of mercury. When mercury enters the water, biological processes transform it into the highly toxic form of methylmercury. Methylmercury accumulates in fish, with larger predatory fish generally accumulating higher levels of methylmercury. Methylmercury is a potent toxin and babies of women who consume large amounts of fish when pregnant are at greater risk for changes in their nervous system that can affect their ability to learn.

Further Investigations – In cooperation with the Arizona Game and Fish Department, ADEQ is investigating human health risks associated with eating fish caught in Arizona's lakes. Fish tissue samples have been collected and analyzed for mercury from the following lakes which were chosen due to present or historic mining, the presence of predatory fish (e.g., largemouth bass, channel catfish, or northern pike), and recreational fishing activity:
Bill Williams Alamo Lake (Bill Williams Watershed); Dogtown Reservoir (Colorado-Grand Canyon Watershed); Ashurst Lake, Fool's Hollow Lake, Lake Mary, Lyman Lake, and Mormon Lake (Little Colorado-San Juan Watershed); Horsethief Basin Lake, Lynx Lake, and Picacho Reservoir (Middle Gila Watershed); Parker Canyon Lake (Santa Cruz-Rio Magdalena-Rio Sonoyta Watershed); Dankworth Ponds and Roper Lake (Upper Gila Watershed); and Goldwater Lake, Granite Basin Lake, Pecks Lake, Stoneman Lake, Watson Lake, and Willow Creek Reservoir (Verde Watershed). Results from this monitoring lead to a fish consumption advisory being issued in May 2002 for Upper Lake Mary and Lower Lake Mary due to the mercury contamination of fish tissue **(Table 15)**.

Why do Fish Kills or Abnormalities Occur? – Fish kills investigated by Arizona Game and Fish Department and found to be due to a water quality concern are reported in **Table 16**. Most of these fish kills were associated with highly productive (eutrophic or hypereutrophic) lakes. Although lake eutrophication is a natural process, it can be accelerated by human activities in the watershed or lake design. Fish kills caused by a reduction in water quantity (i.e., drought, dam releases) or because non-native game fish have been stocked in habitats that cannot support them, are not reported in **Table 16**.

Table 16. Reported Fish Kills and Abnormalities -- 1997-2000

Waterbody Name Watershed – Size	Pollutant and Sources	Dates
Arivaca Lake Santa Cruz-Rio Magdalena-Rio Sonoyta 120 acres	Algal bloom die off and resulting low dissolved oxygen killed 4000-5000 fish over a 4-day period.	June 1999
Cortez Park Lake Middle Gila Watershed 2 acres	Herbicide applications resulted in a massive die-off of aquatic vegetation. Associated low dissolved oxygen then killed approximately 2600 fish.	June 1999
Lake Pleasant Middle Gila Watershed 2,040 acres	Insufficient dissolved oxygen caused by resuspended organic sediments in flood waters.	August 1997
Lakeside Lake Santa Cruz-Rio Magdalena-Rio Sonoyta 14 acres	Insufficient dissolved oxygen caused by algal bloom, exacerbated by high nutrient levels in reclaimed wastewater discharged to the lake.	July 1997
Lake Sierra Blanca Salt Watershed 30 acres	Weed growth and subsequent high pH resulted in the death of approximately 100 rainbow trout.	June 1998
Luna Lake Upper Gila Watershed 120 acres	Algal bloom die-off, high pH, and low dissolved oxygen resulted in several hundred fish dying over a 16-day period.	July 1999
Rainbow Lake Little Colorado-San Juan Watershed 110 acres	Blue-green algal bloom die-off resulted in insufficient dissolved oxygen that killed trout and catfish	June 1997
Salt River, below 91st Ave. WWTP Middle Gila Watershed 5 miles	Inadequate treatment (aeration and denitrophication) due to a power outage, resulted in an extensive fish kill in the Gila River and part of Buckeye Canal.	October 2000
Santa Cruz River below the Nogales International WWTP Santa Cruz-Rio Magdalena-Rio Sonoyta	A high proportion of fish with skin and skeletal anomalies are documented by the US Fish and Wildlife Service in this reach.	Sampling in 1997
Whitehorse Lake Verde Watershed 40 acres	Low dissolved oxygen due to algal bloom die off, killed approximately 4000 fish. The majority of the dead fish were non-native black crappie young of the year.	July 1999